UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/644,378	08/20/2003	Scott Milton Fry	TUC920030083US1	6135

45216 7590 08/04/2009

Kunzler & McKenzie
8 EAST BROADWAY
SUITE 600
SALT LAKE CITY, UT 84111

EXAMINER	
COUGHLAN, PETER D	

ART UNIT	PAPER NUMBER
2129	

MAIL DATE	DELIVERY MODE
08/04/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/644,378	FRY ET AL.	
	Examiner	Art Unit	
	PETER COUGHLAN	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-20,23-25,27-29 and 41-64* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-20,23-25,27-29 and 41-64* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *8/20/2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This office action is in response to an AMENDMENT entered May 26, 2009 for the patent application 10/644378 filed on August 20, 2003.

2. All previous Office Actions are fully incorporated into this Non-Final Office Action by reference.

3. Examiner's Comments:

The Examiner wrote an allowance for this application and only had one question to be answered before submission. The Examiner contacted Mr. Kunzler (Reg. No. 38527) since his name and signature is on the Applicant Arguments dated 5/28/2009. The Examiner called again and asked for an associate of Mr. Kunzler who might have worked on this application and could answer the Examiner's question. The Examiner called the firm of Kunzler and McKenzie 6 times between 7/28/2009 and 7/31/2009 and did not receive a single response. Therefore the Examiner had to generate another non-final to get the questioned answered. The Examiner made all possible efforts to move prosecution forward on this application towards an allowance.

Although, the terms 'carrier wave' or 'carrier signal' is not specifically mentioned within the specification, the Examiner will exclude these interpretations wherein the context of 'media' is disclosed.

Status of Claims

4. Claims 18-20, 23-25, 27-29, 41-64 are pending.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 18-20, 23-25, 27-29, 41-64 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The independent claims recite the ability to adjust a fuzzy variable dynamically during runtime, this critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). The Examiner could not find within the specification where this limitation is described.

These claims need to be amended or withdrawn from consideration.

Response to Arguments

6. Applicant's arguments filed on May 26, 2009 for claims 18-20, 23-25, 27-29, 41-64 have been fully considered but are not persuasive.

7. In reference to the Applicant's argument:

REMARKS

STATUS OF THE CLAIMS

Claims 18-20, 23-25, 27-29, and 41-64 remain in the case. Claims 18-20, 23-25, and 27- 29 stand rejected. Claims 18 and 25 have been amended. Claims 41-66 have been added. No new matter has been added. Claims 1-17, 21-22, 26, and 30-40 have been cancelled. Applicants respectfully traverse the rejections of Claims 18-20, 23-25, and 27-29. New Claims 41-64 substantially encompass the subject matter of previously cancelled Claims 1-17 and 30-40, updated to reflect the amendments to Claims 18 and 25. The amendments are supported in paragraphs [0011]- [0013], [0049]-[0064], [0071], [0075]- [0077], [0094-0095], [0104], [0109], [0112], [0114], and [0127].

RESPONSE TO CLAIM REJECTIONS UNDER 35 U.S.C. § 101

Claims 18-25 and 27-29 are rejected under 35 U.S.C. § 101 for nonstatutory subject matter. Applicants respectfully traverse this rejection in view of the present amendments and the following remarks. Applicants note that the Examiner previously withdrew a similar rejection under 35 U.S.C. § 101 in the Office Action mailed October 14, 2008 in view of Applicants' remarks in the Office Action Response entered June 4, 2008. (Office Action of October 14, 2008, pg. 20 ~[2 - pg. 21, ~[1). Applicants respectfully refer the Examiner to the above referenced remarks describing the statutory nature of the claims at issue, and the useful, concrete, and tangible results of the claims at issue. Applicants further respectfully submit that as amended, each of the claims at issue are clearly tied to a particular machine or apparatus, and are statutory under 35 U.S.C. § 101 based on the "machine-or-transformation test" affirmed by the Court of Appeals for the Federal Circuit in the recent In re Bilski case. (In re Bilski, 545 F.3d 943, 88 USPQ2d 1385 (Fed. Cir. 2008). In a memo to the Patent Examining Corps dated January 7, 2009, Deputy Commissioner for Patent Examination Policy John J. Love announced that the "machine-or-transformation test" should now be used to determine patent eligibility under 35 U.S.C. § 101, the test being "whether the claimed method is (1) tied to a particular machine or apparatus, or (2) transforms a particular article to a different state or thing." (John J. Love, Guidance for Examining Process Claims in view of In re Bilski, January 7, 2009, available at http://ww.uspto.gov/web/offices/pac/dapp/opla/documents/bilski_guidance_memo.pdf

Each of the claims at issue is now tied to a storage system, which is clearly a machine or apparatus and statutory under 35 U.S.C. § 101. For example, Claim 18, as amended, now recites "assisting an end-user of a storage system in generating a failure prediction

algorithm for the storage system," and "generating machine-readable...the machine-readable code configured to exeeute on the storage system." Applicants respectfully submit that Claims 18-25 and 27-29, as well as new Claims 41-66 satisfy the "machine-or-transformation test" and are statutory under 35 U.S.C. § 101 and request that the rejection of Claims 18-25 and 27-29 again be removed.

RESPONSE TO CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 18-25, and 27-29 stand rejected under 35 U.S.C. §103(a) as being unpatentable over "Application of Fuzzy Logic to Reliability Engineering" (hereinafter Bowles), in view of "Improved Disk Drive Failure Warnings" (hereinafter Hughes), "Fuzzy Rule-based Expert System for Power System Fault Diagnosis" (hereinafter Monsej), U.S. Patent No. 5,832,467 to Wavish (hereinafter Wavish), "Fixed Time Life Tests Based on Fuzzy Life Characteristics" (hereinafter Kanagawa), "Fuzzy Fundamentals" (hereinafter Cox), "Fuzzy Guidance Controller for an Autonomous Boat" (hereinafter Vaneck), and/or "A Layer Based Computational Model Plus a Database Structure as a Framework to Build Parallel Fuzzy Controllers" (hereinafter Andrade).

Applicants respectfully note at the outset that in order to establish a prima facie case of obviousness, it is the burden of the Examiner to clearly articulate the reason(s) why the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made. See MPEP § 2141.III. As stated by the U.S. Supreme Court in KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727 (2007), the analysis supporting a rejection made under 35 U.S.C. § 103 should be made explicit. Moreover, the Court also stated in KSR that "...[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." Id. at 1740-1742.

The U.S. Supreme Court in KSR upheld the use of the Graham Factors to determine obvious, the Graham Factors being: (1) the scope and content of the prior art; (2) the differences between the prior art and the claimed invention; (3) the level of ordinary skill in the art; and (4) any relevant secondary considerations, such as commercial success, long-felt need, and the failure of others. See KSR at 1734; Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 17-18, 86 S.Ct. 684, 15 L.Ed.2d 545. Applicants respectfully submit that an analysis of the Graham Factors clearly shows that the cited art does not render the claimed invention obvious, and respectfully request that if the Examiner disagrees with the Applicants, that further rejections include a Graham Factor analysis for each rejection under 35 U.S.C. § 103, as mandated by KSR and MPEP § 2141. Applicants respectfully assert that the claims at issue are not obvious. First, not all elements of the amended claims are taught or suggested in the art of record, and second, the art of record comes from vastly different fields than does the Applicants' claimed invention and teaches away from their combination.

Applicants respectfully submit that Bowles, Hughes, Monsef, Wavish, Kanagawa, Cox,

Vaneck, and Andrade do not teach "assisting an end-user of a storage system in generating a failure prediction algorithm for the storage system, the failure prediction algorithm comprising fuzzy logic rules." The cited art further does not teach "generating machine- readable code from the stored failure prediction algorithm in response to input from an end- user, the machine-readable code configured to execute on the storage system," or "tuning the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end-user of the storage system." Applicants further submit that Bowles, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade are nonanalogous art, that they teach away from their combination, and that these differences between the prior art and the claims at issue render the claims at issue nonobvious and allowable under 35 U.S.C. § 103(a).

To highlight the differences between the present invention and the cited prior art, as mandated by Graham, a summary of the claimed invention and of the prior art may be useful. Generally, the claimed invention seeks to overcome problems of the prior art associated with the maintenance and storage of data within a storage system and with the development of failure prediction software for the storage system. (Specification, q[[0001]). For example, in the art, complicated software routines written by experienced software engineers use a high number of input variables to provide stability reports for storage systems. This means that the algorithms are determined by software engineers and not by end-users that are most familiar with storage systems, and that the algorithms are not customizable to unique circumstances, especially dynamically at runtime. End-users must use whatever algorithm the software engineers have established, and must wait through a lengthy development cycle for updates, with no guarantee that a future release will bring any changes, much less customized changes based on the needs of the end-user. Additionally, conventional software uses discrete threshold values which often do not adequately reflect the range of operating conditions in which storage systems operate, generating costly false-positives.

Independent Claim 18, as amended, specifically requires "assisting an end-user of a storage system in generating a failure prediction algorithm for the storage system, the failure prediction algorithm comprising fuzzy logic rules, the failure prediction algorithm stored in a natural language format; generating machine-readable code from the stored failure prediction algorithm in response to input from an end-user, the machine-readable code configured to execute on the storage system; testing the machine-readable code with sample data to produce a result in response to input from an end-user; selectively revising the failure prediction algorithm in response to input from an end-user such that the result corresponds to an expected result; and tuning the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end-user of the storage system." (emphasis added).

Independent Claim 25, as amended, specifically requires "gathering performance data for a storage system; executing a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules

generated by an end-user of the storage system, the fuzzy logic rules defined by conditional statements that include subjects, adjectives, and verbs familiar to personnel in the storage system field; tuning the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end user of the storage system; and selectively forecasting failure of one or more components of the storage system in response to the result." (emphasis added).

New independent Claim 41 is an apparatus for developing failure prediction software for a storage system that comprises an editor, a code generator, a test module, a revision module, and an interface. New independent Claim 47 is an apparatus for predicting component failure within a storage system comprising a performance monitor, a processor, a determination module, and an interface. New independent Claim 52 is a system for predicting component failure within a storage system comprising a controller, a communication module, a drive mechanism, and an analysis module. New independent Claim 56 is an apparatus for developing failure prediction software for a storage system. New independent Claim 61 is an article of manufacture comprising a program storage medium readable by a processor and embodying one or more instructions executable by a processor to perform a method for developing failure prediction software for a storage system.

The Scope and Content of the Prior Art
Summary of Bowles

Bowles describes several models for characterizing system reliability using fuzzy arithmetic. (Bowles, Abstract). Bowles uses general examples, such as "Hans ate v eggs for breakfast," focusing on the mechanics of fuzzy arithmetic instead of specific applications. (Bowles, pg. 438, ~[5). Two specific areas of art mentioned in Bowles are the nuclear and aerospace industries. (Bowles, pg. 442, ~[6).

Bowles does not address failure prediction algorithms or storage systems, addressing instead general system reliability and the general probability of events. (Bowles, Abstract; Bowles, pg. 439, col. 2). Bowles further does not teach a method for assisting an end-user in generating a failure prediction algorithm comprising fuzzy logic rules, as required by the claims at issue, not mentioning an end-user, a storage system, a failure prediction algorithm, revising a failure prediction algorithm, or tuning a failure prediction algorithm dynamically at runtime.

Summary of Hughes

Hughes proposes various algorithms for SMART failure prediction systems to predict failure in disk-drives. (Hughes, Abstract). The algorithms proposed in Hughes are designed to be run on as microprocessor firmware on a disk-drive. (Hughes, Abstract).

The Office Action suggests that "running the 'SMART' application of Hughes" is

equivalent to generating machine-readable code from the stored failure prediction algorithm in response to user input as required by Claim 18. (Office Action, Page 4, ~[1).

Applicants respectfully submit that running an application is not equivalent to "generating machine-readable code from the stored failure prediction algorithm" of Claim 18. The microprocessor of Hughes does run the SMART failure warning algorithm, which presumably comprises machine-readable code. This does not necessarily imply that the SMART failure warning algorithm was compiled, as device level microprocessor code is often written directly as machine readable code and not compiled. Even if it was compiled, Hughes does not teach compiling a failure prediction algorithm comprising fuzzy logic rules stored in a natural language format into machine readable code. For an element to be considered inherent, it must necessarily be present in the reference. See MPEP 2112.IV.

In direct contrast to the claims at issue, Hughes teaches that a storage drive itself measures up to 30 failure attributes, and that this technology is "manufacturer proprietary." (Hughes, pg. 351, C1:20-43). Because the technology is proprietary, Hughes does not teach what, if anything is compiled, and clearly does not teach generating machine-readable code from a natural language format failure prediction algorithm comprising fuzzy logic rules. It is more likely that the SMART algorithm is implemented as a combination of hardware sensors and low level instructions, however Hughes expressly states that the implementation of the technology is proprietary, and is thus unknown. Hughes cannot teach something that is unknown. Hughes does not teach, suggest, or even mention compiling, and clearly does not teach generating machine-readable code from a stored failure prediction algorithm in a natural language format.

Summary of Monsef

Monsefdemonstrates a component oriented fuzzy expert system for power system fault diagnosis. (Monsef, Abstract). Monsefteaches the diagnosis of existing faults in a power system by modeling the power system and comparing simulation results with actual system information to diagnose a power system fault. (Monsef, pg. 186, ~[4).

Monsefdoes not teach testing machine-readable code with sample data to produce a result in response to end-user input, as required by the claims at issue. Applicants respectfully submit that modeling a power system and running a simulation to diagnose an existing power system fault does not read on testing a machine-readable code failure prediction algorithm with sample data to produce a result in response to end-user input. Monsefdoes not teach machine-readable code, a failure prediction algorithm, or sample data.

Summary of Wavish

Wavish teaches a rule-based data processing apparatus for optimization of behavioral prediction in Real Time ABLE (RTA) autonomous agents such as robots, artificial intelligences, and the like. (Wavish, col. 1, 11.4-67). Wavish teaches the use of genetic algorithms that generate chromosomal representations. (Wavish, Abstract; Wavish, col. 2, 11.47-51).

Wavish teaches that autonomous agents are defined by a first set of rules and a second set or rules. (Wavish, col. 2, 11.5-26) The second set of rules predicts the agent state changes caused by the first rules. (Id.). The autonomous agent monitors the accuracy of the second set of rules and modifies the second set of rules to increase their accuracy. (Id.).

The autonomous rule modification of Wavish does not read on selectively revising a failure prediction algorithm in response to end-user input such that the result corresponds to an expected result for several reasons. Wavish does not teach revising a failure prediction algorithm, but instead teaches modifying behavioral rules. Additionally, even if Wavish did teach revising a failure prediction algorithm, Wavish teaches that the autonomous agent modifies the rules itself, in response to its' own monitoring of the rules, not in response to end-user input. In direct contrast to the present invention, the entire purpose of RTA agents such as robots,artificial intelligences, and similar rule-based systems as described in Wavish is to minimize user interaction and control.

Summary of Kanagawa

Kanagawa teaches calculating the reliability, or mean time between failures (MTBF), of a group by letting a sample from the group run until failure. (Kanagawa, Abstract). Kanagawa then calculates whether the MTBF is acceptable or not using fuzzy logic sets. (Kanagawa, Abstract; Kanagawa, col. 2, 11. 10-16).

The reliability demonstration test of Kanagawa does not use a failure prediction algorithm to predict failure, it lets devices run until they do fail, thereby demonstrating reliability. The reliability demonstration does not involve any prediction, and Kanagawa does not teach failure prediction. Kanagawa teaches the monitoring of failures in "fixed-time life tests," which is fundamentally different than generating a failure prediction algorithm. (Kanagawa, col 2, 11. 10-16).

Applicants further respectfully submit that even if Kanagawa' s reliability demonstration were a failure prediction algorithm, it does not comprise fuzzy logic rules. Kanagawa does teach the use of fuzzy sets in deciding whether or not a lot has an acceptable MTBF. Fuzzy sets are fundamentally different than fuzzy logic rules, and their use in Kanagawa is also different than in Claim 25.

Fuzzy logic rules are logical expressions that operate on fuzzy sets (also known as fuzzy variables) to produce an output, much as an algebraic expression operates on a variable. See paragraphs [0052] and [0102]-[0118] of the Specification for a detailed description of fuzzy logic rules and fuzzy logic sets/variables. Kanagawa teaches the use of fuzzy logic sets in determining whether a group of devices is acceptable. Applicants submit, however, that Kanagawa does not teach fuzzy logic rules, and clearly does not teach a failure prediction algorithm that comprises fuzzy logic rules. Kanagawa's fuzzy logic sets are not fuzzy logic rules, are not stored in a natural language format, and do not predict failure.

The Office Action also suggests that Kanagawa teaches the "gathering performance data for a storage system" of Claim 25 with "the ability to have 'n items be drawn at random.'" (Office Action, pg. 7, ~[1; Kanagawa, col. 2, ll. 7-16). The n items of Kanagawa are a sample of a group or "lot." (Kanagawa, col. 2, 11.7-16). Selecting a random sample of items from a lot is clearly not gathering performance data for a storage system. Kanagawa does not teach a storage system, or gathering performance data for that storage system.

The Office Action further suggests that Kanagawa teaches "executing a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules. (Office Action, pg. 7, ~[1). As discussed above, Kanagawa lacks a failure prediction algorithm comprising fuzzy logic rules. Applicants further submit that Kanagawa does not teach executing a failure prediction algorithm on performance data to produce a result. Applicants respectfully submit that Kanagawa does not teach a failure prediction algorithm and further that Kanagawa does not teach executing anything.

The Office Action also suggests that Kanagawa's teaching that "the coefficients aij must be chosen so that the membership functions are continuous" is equivalent to "tuning the failure prediction algorithm by adjusting a fuzzy variable definition" of Claim 25. (Office Action, pg. 7, ~[1). Applicants respectfully submit that defining a polynomial membership function as continuous is not equivalent to tuning a failure prediction algorithm by adjusting a fuzzy variable definition. Kanagawa is merely stating the fact that the membership functions (examples of which are illustrated in Kanagawa's Table 1 on page 319) must be continuous. Even if this could be construed as a fuzzy variable definition, Kanagawa does not adjust the definition (it "must" be continuous), and clearly does not tune a failure prediction algorithm. At most, Kanagawa defines a membership function for an acceptability decision, but clearly does not tune a failure prediction algorithm by adjusting a fuzzy variable definition.

Summary of Cox

Cox provides a general description of how fuzzy logic may be used in control systems

such as anti-lock braking systems and steam turbines. (Cox, pg. 58, col. 1, ~[4; Cox, pg. 59, col. 1, ~[2). Cox does not teach fuzzy logic rules comprising linguistic variables having less than four terms. In the example from Cox cited in the Office Action, the variable 'temperature' may have at least six terms "cold, cool, moderate, warm, hot, very hot," not less than four terms or three terms as required by Claims 19 and 20. (Office Action, pg. 11, ~[4; Cox, pg. 58, col. 2, ~[2).

Summary of Vaneck

Vaneck describes a fuzzy controller used to chart paths for a small autonomous boat prototype vehicle using GPS. (Vaneck, Abstract; Vaneck, pg. 45, ~[3).

Summary of Andrade

Andrade teaches the use of parallel fuzzy processors in industrial process control. (Andrade, Abstract).

The Differences between the Cited Art and the Claimed Invention

In view of the above described differences between the claimed invention and the art of record under the Graham analysis, Applicants respectfully submit that the claims at issue are not obvious. First, not all elements of the amended claims are taught or suggested in the art of record, and second, the art of record teaches away from the proposed combination, and comes from vastly different fields than does the Applicants' claimed invention and is clearly nonanalogous art.

Applicants respectfully submit that Bowles, Hughes, Monsef, Wavish, Kanagawa, Cox, Vaneck, and Andrade do not teach "assisting an end-user of a storage system in generating a failure prediction algorithm for the storage system, the failure prediction algorith comprising fuzzy logic rules, the failure prediction algorithm stored in a natural language format" as recited in amended Claim 18 (emphasis added). Applicants further submit that Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade do not teach "generating machine- readable code from the stored failure prediction algorithm in response to input from an end user, the machine-readable code configured to execute on the storage system," "testing the machine-readable code with sample data to produce a result in response to input from an end- user," "selectively revising the failure prediction algorithm in response to input from an end- user such that the result corresponds to an expected result," or "tuning the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end-user of the storage system" as recited in amended Claim 18 (emphasis added).

Teaching Away

Because the Hughes reference clearly teaches that the technology is proprietary, and is

not available to end-users, as described above, Hughes teaches away from end-users of a storage system generating a failure prediction algorithm for the storage system and tuning the failure prediction algorithm dynamically at runtime. By teaching that failure attributes should be manufacturer proprietary, Hughes directly teaches away from the claimed invention as amended.
Hughes teaches the solutions already available in the art as described above, depending on experienced software engineers and their development cycles to define "manufacturer proprietary" warning algorithms.

Further, Wavish teaches away from selectively revising a failure prediction algorithm. Wavish teaches that the autonomous agent modifies the rules itself, in response to its' own monitoring of the rules, not in response to end-user input. (Wavish, col. 2, 11.5-26). As described above, the entire purpose of RTA agents such as robots, artificial intelligences, and similar rule- based systems as described in Wavish is to minimize user interaction and control, and Wavish teaches away from such end-user interaction.

The Kanagawa reference also teaches away from the claimed invention. Kanagawa clearly teaches letting devices run until they fail, thereby demonstrating reliability, teaching away from predicting their failure at all. Kanagawa teaches the monitoring of failures in "fixed-time life tests," directly teaching away from generating a failure prediction algorithm. (Kanagawa, col 2, 11. 10-16).

The Cox reference further teaches away from the claimed invention. While Claims 19 and 20 recite that "the fuzzy logic rules comprise linguistic variables having less than four terms" or alternatively "less than three terms." Cox directly teaches away from this limitation, teaching, in the example from Cox cited in the Office Action, that the variable 'temperature' may have at least six terms "cold, cool, moderate, warm, hot, very hot," not less than four terms or three terms as required by Claims 19 and 20. (Office Action, pg. 11, ~[4; Cox, pg. 58, col. 2, ~[2).

Nonanalogous Art

Applicants further submit that Bowles, Monsef, Wavish, Kanagawa, Cox, Vaneck, and Andrade are nonanalogous art. As quoted in M.P.E.P § 2143, the recent Supreme Court case of KSR v. Teleflex requires that, when determining "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue[,] to facilitate review, this analysis should be made explicit." KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727 (2007). Even if Bowles, Hughes, Monsef, Wavish, Kanagawa, Cox, Vaneck, and Andrade taught each and every element of the claimed invention, the Office Action has made no explicit analysis of why one of ordinary skill in the art of storage systems would look to the nonanalogous and disparate fields of the nuclear and aerospace industries, power systems, RTA autonomous agents, anti-lock braking systems, steam turbines, and small autonomous boats, or why such matter"

logically would have commended itself to an inventor' s attention in considering his problem." In re Clay, 966 F.2d 656, 659 (Fed. Cir. 1992).

Applicants respectfully submit that the claimed invention is a pioneering invention. The art cited in the Office Action clearly indicates that no one in the art of data storage systems has taught or suggested the use of fuzzy logic in a storage system failure prediction algorithm, much less assisting end users of storage systems to generate their own customized fuzzy logic failure prediction algorithms for use on their own storage systems, and tuning the algorithm dynamically at runtime.

Impermissible Hindsight

The discovery of the cited art seems to have come from a search that is based on impermissible hindsight, the only factor linking search results being Applicants' novel and non- obvious use of fuzzy logic for customized failure prediction of data storage systems. Appellants respectfully submit that if the prior art of record so clearly demonstrates the obviousness of the claimed invention, a single reference would teach more than just one or two elements of the claimed invention. The sheer number of references used from such extreme disparate fields of art seems to indicate that the claim terms were used in a key word search of the prior art, likely for the term "fuzzy logic." For certain claims up to six different references are relied upon, and every rejection relies on at least four different references. Once a key word hit was found, there appears to be little analysis performed to determine the applicability of relevance of the reference, or why one of ordinary skill in the art of storage systems would look to the reference. The present group of prior art references is the third such group relied upon, and none of the groups teach each and every element of the claims, or relate remotely to storage devices. Appellants respectfully assert that because such analysis is improper the rejections should be overturned.

The Level of Ordinary Skill in the Art

MPEP § 2141.11. C states that:

"The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art may include: (1) "type of problems encountered in the art;" (2) "prior art solutions to those problems;" (3) "rapidity with which innovations are made;" (4) "sophistication of the technology; and" (5) "educational level of active workers in the field. In a given case, every factor may not be present, and one or more factors may predominate." In re GPAC, 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995); Custom Accessories, Inc. v. Jeffrey-Allan Industries, Inc., 807 F.2d 955,962, 1 USPQ2d 1196, 1201 (Fed. Cir. 1986); Environmental Designs, Ltd. V. Union Oil Co., 713 F.2d 693,696, 218 USPQ 865, 868 (Fed. Cir. 1983)."

Typical problems encountered in the art of storage systems include formatting and preparing storage devices for use, installing and replacing storage devices, configuring storage device arrays, and the like. Prior art solutions to these problems include the use of generic device diagnostics like the SMART system described in the Hughes reference. A person having ordinary skill in the art would likely not know what fuzzy logic was, and would clearly not look to the fields of the nuclear and aerospace industries, power systems, RTA autonomous agents, anti-lock braking systems, steam turbines, and small autonomous boats. Even if the cited art did teach or suggest the claimed invention, which it clearly does not as described above, a person having ordinary skill in the art would clearly not look to these disparate areas for solutions to storage system problems, but would look to traditional storage system solutions.

Graham Factors Indicate Non-Obviousness

As described above, each of the Graham Factors lead to a clear conclusion that the claimed invention is nonobvious in view of Bowles, Hughes, Monsef, Wavish, Kanagawa, Cox, Vaneck, and Andrade. Applicants respectfully submit that Bowles, Hughes, Monsef, Wavish, Kanagawa, Cox, Vaneck, and Andrade do not teach or suggest "assisting an end-user of a storage system in generating a failure prediction algorithm for the storage system, the failure prediction algorithm comprising fuzzy logic rules." The cited art further does not teach "generating machine-readable code from the stored failure prediction algorithm in response to input from an end-user, the machine-readable code configured to execute on the storage system," or "tuning the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end-user of the storage system." Applicants further submit that Bowles, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade are nonanalogous art, that they teach away from their combination, that they were assembled using impermissible hindsight, and that these differences between the prior art and the claims at issue render the claims at issue nonobvious and allowable under 35 U.S.C. § 103(a).

Applicants further submit that although the remarks have focused specifically on the limitations of independent Claim 18 as representative of similar limitations in independent Claims 25, 41, 47, 52, 56, and 61, that independent Claims 25, 41, 47, 52, 56, and 61 contain further limitations that are patentably non-obvious. Given that dependent Claims 19-20, 23-24, 27-29, 42-46, 48-51, 53-55, 57-61, and 63-66 depend from Claims 18, 25, 41, 47, 52, 56, and 61, Applicants respectfully submit that Claims 19-20, 23-24, 27-29, 42-46, 48-51, 53-55, 57-61, and 63-66 are also patentable over Bowles, Hughes, Monsef Wavish, Kanagawa, Cox, Vaneck, and Andrade. See in re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Applicants respectfully request that the rejection of Claims 18-25 and 27-29 under 35 U.S.C. § 103(a) be withdrawn and that Claims 18-25, 27-29, and 41-66 be deemed allowable.

Examiner's response:

In light of the amended claims, all previous art has been withdrawn.

Examination Considerations

8. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has the full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

9. Examiner's Notes are provided to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and sprit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but link to prior art that one of ordinary skill in the art would find inherently appropriate.

10. Examiner's Opinion: Paragraphs 8 and 9 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

11. Claims 18-20, 23-25, 27-29, 41-64 are rejected.

Correspondence Information

12. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 272-3150 (for formal communications intended for entry.)

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have any questions on access to Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

/P. C./

Examiner, Art Unit 2129

Peter Coughlan

7/31/2009

/David R Vincent/

Supervisory Patent Examiner, Art Unit 2129